DISARMAMENT:

the view from Moscow

Alexei Arbatov, Vladimir Baranovsky

Stopping Nuclear Tests

THE PROBLEM OF ENDING NUCLEAR TESTING HAS BEEN ON THE DISARMAMENT AGENDA FOR THIRTY YEARS

a simple and effective step as yet untaken

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On December 8, 1987, Mikhail Gorbachev and Ronald Reagan signed a Soviet-American treaty in Washington on the elimination of the countries' medium-range and shorter-range missiles. This treaty marks the first agreement doing away with two entire classes of nuclear weapons. The sides concurred that by the time of the next summit meeting scheduled to be in Moscow in the first half of 1988, the two sides would try to have a treaty ready for signing on cutting their strategic nuclear arsenals virtually by 50 percent.

The importance of both the first treaty, which has already been signed, and the one now being drafted can really not be overestimated. Neither of them, however, effectively obstructs the process of modernization of nuclear arsenals. Nuclear tests still remain a key area of the nuclear arms race and an essential factor for the development of new types of weaponry, including such a fundamentally new class of offensive systems as space-strike weapons. For this reason, reaching agreement on a nuclear-test ban must be considered a major issue of nuclear disarmament.

Some History

A nuclear-test ban began being widely discussed more than 30 years ago, after the United States conducted the first tests of hydrogen bombs with yields of one megaton and more.* On March 1, 1954, the crew of the Japanese vessel *Fukurya Maru* suffered badly from radioactive fallout resulting from an experimental blast let off near the Bikini atoll, Marshall Islands. The incident came to symbolize the threat to human life and health posed by nuclear-weapon tests.

A treaty banning nuclear-weapon tests in three media—in the atmosphere, under water and in outer space—was signed by the Soviet Union, the United States and Great Britain in Moscow on August 5, 1963. Since then, more than 100 nations have joined the treaty, which has been a major factor saving our environment from the dire effects of nuclear explosions.**

Underground nuclear explosions also pose a definite risk of contamination to the environment and people. A 1966 test at the range in Nevada resulted in an escape of radioactivity

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* One megaton is equal to 1,000 kilotons. The atom bomb dropped on Hiroshima in 1945 had a yield of 20 kilotons, or a yield equal to a blast of 20,000 tons of conventional TNT.

** According to data from the Stockholm International Peace Research Institute (SIPRI), a total of 547 nuclear-weapon tests had been carried out as of August 5, 1963, of them 77 percent had been conducted in the atmosphere. After the Moscow treaty was signed, there were a total of 63 atmospheric tests done by France (the last in 1974) and by China (the last in 1980), which are not parties to the treaty.

American experts watching a nuclear test on Eniwetok in 1951.

The United States carried out tests of the highest yields, which are accordingly the most dangerous tests, outside its national territory—on the Bikini and Eniwetok atolls, Marshall Islands. Sixty-six nuclear devices were tested there between 1946 and 1958.

On March 1, 1954, the United States exploded a 15 Mt H-bomb on Bikini, destroying the small coral island. According to *The Washington Post*, four hours after the blast white radioactive flecks began falling on the people living on the Rongelap atoll, 105 miles east of Bikini.

Four hours after that another inhabited island in the Pacific, Rongerik, became the victim of radioactive fallout. White radioactive dust rained down for 12 hours on the roofs of dwellings in the Marshall Islands, contaminating the main sources of drinking water. On Rongerik Island alone, each inhabitant received a dose of radiation averaging 175 rads.

In 1968, President Lyndon Johnson promised to clean up part of the Bikini atoll so that the native people could return there. But Bikini still remains too contaminated to be re-populated.

Iron Kebenli from the Rongerik atoll, a victim of radioactive fallout.

which spread over five US states. The level of radioactivity soared by 20 times in the Montreal-Ottawa area in Canada following another test in Nevada in 1970. High yield underground nuclear tests are particularly dangerous *

As opposed to the 1950s and 1960s, the ongoing nuclear tests have now placed the spotlight on other problems They constitute a major part of the nuclear arms race Without experimental explosions it is virtually impossible to modernize nuclear warheads or develop new types of weapons. Banning underground tests would clearly place a reliable barrier to the modernization of existing nuclear arsenals, modernization which might destabilize the strategic balance

Important agreements towards this goal have been signed by the Soviet Union and the United States· a 1974 treaty setting a yield ceiling of 150 kt on underground tests of nuclear weapons, and a 1976 treaty imposing the same limit on underground nuclear explosions for peaceful purposes Though neither of the treaties have as yet been ratified by the United States Senate and thus have not officially become effective, both sides have abided by the restrictions imposed by the agreements.

At the same time, the 150 kt ceiling still leaves plenty of room for nuclear tests,** especially considering that the trend is now to make nuclear warheads more compact and with lower yields. Furthermore, scale testing, or the testing of warheads to only part of their yield power, is being used extensively. So, overall, the ceiling fixed by the 1974 treaty places no significant restrictions on the work to make nuclear warheads more effective or to develop new types of warheads.

It is quite obvious that a complete ban of all underground tests would considerably limit the opportunities for renewing nuclear arsenals. The Soviet Union, the United States and Great Britain opened talks on this subject in 1977 By the

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* The most powerful underground nuclear blast ever, equalling 5 Mt, was carried out by the United States on the Aleutian Islands in 1971

** Out of the 30 types of nuclear warheads in the United States 17 have yields of up to 100 kt (nine of them up to 5 kt)

summer of 1980 most of the work on a ban had been done, with only a few secondary problems concerning verification remaining unresolved However, when the new Administration took office the United States withdrew from the negotiations and in 1982 officially announced that a treaty on a total nuclear-weapon test ban did not at the moment correspond to US security interests.

Washington's refusal to work towards a total nuclear test ban marked a dramatic turn in American policy on the issue. In effect, it repudiated the line that the United States had followed for a quarter of a century. In the late 1950s the United States officially backed the idea of a test ban, and from 1958 to 1961 it observed moratorium on nuclear tests together with the Soviet Union. In the 1963 treaty the United States, jointly with the Soviet Union and Great Britain, stated that it was "seeking to achieve the discontinuance of all test explosions of nuclear weapons for all time" and that it was "determined to continue negotiations to this end". These sentiments were also written into the 1968 Treaty on the Non-Proliferation of Nuclear Weapons As a party to the two treaties, the United States pledged to work towards this goal on the basis of international law. This was also the aim of the talks held between these three nuclear powers in the late 1970s. The new Administration's policy on nuclear tests, in other words, was essentially a rejection of the course followed by the United States under six previous presidents, namely, Dwight Eisenhower, John Kennedy, Lyndon Johnson, Richard Nixon, Gerald Ford and Jimmy Carter

This about-face took place against the backdrop of a noticeable change in international opinion as regards the problem of banning nuclear tests. Though the issue had remained on the agenda, it had not really been considered a central problem in the context of arms limitation. Attitudes to a test ban were largely based on much the same ideas as those forming the concept of "mutual assured destruction". Since a further expansion of nuclear potentials no longer made any sense, the usefulness of continuing nuclear tests was also

questioned * But since a ban would not reduce the size, or excessive size of nuclear arsenals, it was not considered a radical solution that would bring about a fundamental change in the situation in the field of limiting nuclear arms.

A nuclear test ban became a focal point of political struggle in the mid-1980s and began attracting a lot of attention. The vigorous Soviet efforts to ban tests and especially the unilateral moratorium on nuclear explosions undertaken by the Soviet Union in August 1986 were unquestionably the reason for this. This moratorium, despite continued nuclear tests in the United States, was extended four times and lasted eighteen months.

From the very beginning the Soviet Union urged the United States to follow suit. Why did it urge the United States alone? Because the other nuclear powers believe that it is up to the Soviet Union and the United States to take the first steps in the field of nuclear disarmament in general, and the banning of tests in particular, since they account together for over 95 percent of the world's nuclear arsenals and have carried out about 90 percent of all nuclear tests.

The Soviet moratorium met with widespread international appreciation and created a completely new situation in the efforts for disarmament It became ever more obvious that this was not a peripheral or secondary problem, but a step which could have a cardinal impact on the development of some of the key strategic and military political trends Furthermore, a test ban would make it possible to restrict the development of strategic, medium range and shorter range nuclear systems and immediately, without becoming mired in a great many military technical, geostrategic and political problems and disproportions. Thus it can be said without any exaggeration that in this sense a test ban would appear to be

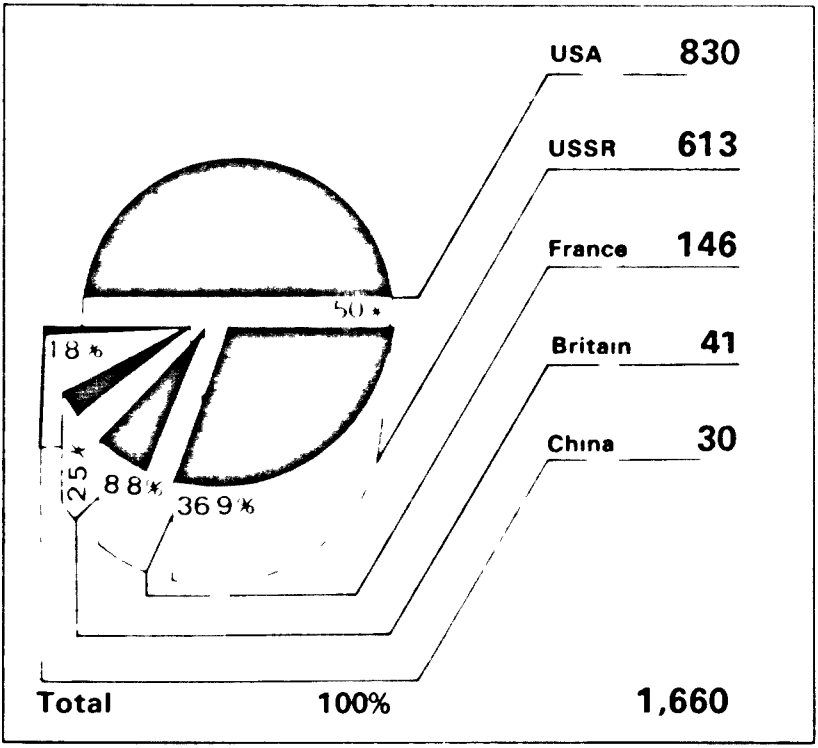
* In 1967 the United States had 32,000 nuclear warheads, the greatest number ever By 1980 this number had been reduced to 25,000 During that period, eight new types of nuclear warheads had come into service and 18 had been phased out (including modifications for different delivery systems)

one of the most fundamental steps that can be taken in the field of disarmament

The US Administration views a total ban on nuclear tests as too radical a measure, and this is why it has been opposed to it. It argues that a total ban is impossible in the foreseeable future for the following two main reasons.

One, it is argued that the verification systems are not reliable enough to monitor such an agreement. Also, it is claimed that discerning a low-yield nuclear blast from the multitude of strong and weak earthquakes occurring annually and recorded with the help of seismic monitors might prove

TOTAL NUMBER OF NUCLEAR TESTS
(by January 1, 1988)



difficult. References are made to various ways of concealing nuclear tests, such as, for instance, by conducting them against the background of earthquakes, camouflaging them to look like explosions for peaceful purposes, etc. In a report published in August 1986, the United States Arms Control and Disarmament Agency maintained that monitoring observance of a comprehensive nuclear test ban, especially any test moratorium like the one proposed by the Soviet Union, remained a major problem.

On the other hand, it is claimed that halting tests would undermine the effectiveness of nuclear deterrence. According to American views, nuclear weapons will remain the back bone of the great powers' military potentials for a long time to come, and therefore ensuring the reliability and effectiveness of nuclear weapons by conducting experimental explosions remains an essential factor of guaranteeing national security and maintaining an acceptable global balance of forces. It is alleged that the Warsaw Treaty Organization is superior in armed forces and conventional armaments and that the North Atlantic alliance has to "compensate" this superiority with nuclear weapons.

But from the point of view of both logic and facts, these two arguments cannot be supported.

Verification

The complicated nature and importance of the problem of verification should not be underestimated. This applies both to arms limitation in general and to banning nuclear tests in particular

"There can be no disarmament without verification," Mikhail Gorbachev said in this connection, "and verification without disarmament makes no sense either " The rule here, as in many other areas of disarmament, is as follows. the

more radical are the measures agreed upon by both sides, the more stringent must be the requirements for verifying compliance with them Without such verification either of the two sides could have serious doubts concerning possible violations by the other And the more profound and far reaching the limitations are, the more serious, from the point of view of security, their violation might be. Thus verification must then be all the more reliable.

Take, for example, the 1963 treaty banning nuclear-weapon tests in three media. Its observance was quite easily verified with the help of national technical means. The United States used its Vela satellites with X-ray detectors and photometers to monitor outer space and the atmosphere for nuclear explosions. These functions will be exercised in the future by the more sophisticated instruments of this type on board the NAVSTAR, the new US navigation satellites.

Much more difficult problems have come up concerning the restrictions imposed by the 1974 and 1976 treaties on underground nuclear tests. Limits on yields here require much of geophysical monitoring means. In order to establish that a blast yield has not exceeded the fixed limit, it is necessary that these means be highly sophisticated instruments capable of analysing seismic waves passing through thousands of kilometers of various types of geological strata.

A total nuclear-test ban raises even more difficult problems. The main problem is how to detect whether there has been a banned explosion amongst the 20,000 earthquakes of varying intensity that occur in various parts of the world every year. It used to be that science and technology were unable to provide accurate enough identification One of the reasons why an agreement on a total test ban was not reached in 1963 was that a certain type of surface seismic waves (the so-called Love wave) were suddenly detected after a series of experimental blasts at the US nuclear testing range in Nevada These waves had previously been considered typical only of earthquakes Some time later it was discovered that when tests are carried out in rocks which are in a state of tectonic strain, the cavity formed by the blast provokes a

weak secondary earthquake which generates Love waves If this had been known at the time, the problem of banning all tests might have been solved back in 1963, and the entire subsequent course of developments in the field of military strategy and disarmament might have been different

Many of the world's top scientists are now of the opinion that science and technology can provide sufficient verification of a total nuclear test ban This was once again reaffirmed by scientists from the Soviet Union, the United States, West European countries, Japan and other nations when they considered the issue of banning nuclear tests at a meeting in Moscow in July 1986

Needless to say, this issue should be approached in a realistic way and the criteria of reliability should not be stretched to an absurdity. As was already said, nuclear explosions in outer space and the atmosphere are detected quite easily with the help of special satellites Hydroacoustic waves from an underwater nuclear explosion differ so greatly from the effects of an earthquake under the seabed that test detection here is not a problem either Furthermore, over 90 percent of all natural seismic activity occurs at a depth of more than 30 kilometers and or under the ocean floor, so such activity can be confidently crossed off the list of potential nuclear blasts *

Monitoring means have become highly sophisticated instruments Modern seismometers can record ground tremors of under one manometer (i e , one millionth of one millimeter) which is comparable to the diameter of an atom Computers can identify nuclear blasts among earthquakes with a sufficient degree of accuracy by comparing the energy (magnitude) of surface and deep seismic waves and analysing four main types of these waves which to varying extents are characteristic of blasts and quakes On the whole, most geophysicists agree that it is possible to accurately identify even 1 kt or 2 kt nuclear explosions

* The deepest artificial boreholes have not yet reached the 12 km mark nor have there been underground nuclear explosions carried out at a depth of more than two kilometers

Are there any ways of concealing nuclear blasts considering the present state of technical means of detection? Out of all imaginable concealment techniques scientists regard what is known as "decoupling" as the most probable one (carrying out explosions in large underground cavities). In this case, much of the shock wave is absorbed when it enters rocks. Specialists who take the question of verification to an extreme argue that blasts under 1 kt can not be detected at all. Decoupling, they say, can reduce by two hundred times the seismic signal from a 1 kt nuclear test and thus make it equal to the signal from a 5 t blast, blasts that are employed in mining, construction and other economic activities

This circumstance, however, is not an insuperable obstacle to verifying a total test ban. It takes a great deal of effort to make cavities To ensure full decoupling in the event of a 8 kt explosion, for example, it would be necessary to remove a mass of rock equal in volume to the Great Pyramid in Egypt. Concealing this activity and the blast itself would be difficult, since there would be outward signs pointing to military testing Besides, there is no ruling out the possibility of a cave-in over the test site and an escape of radioactivity through ground fissures These effects can be detected by various national technical means (including space based means) supplementing the seismic methods

Furthermore, the latest research has proved that by optimizing seismometers for waveforms in frequencies over 30 Hz decoupling is detectable. In high seismic frequencies there is a particularly contrasting difference between a blast and an earthquake, the waves spread over much longer distances, and the level of natural and artificial seismic noise is much lower

Another thing is that the benefits of one low yield test carried out by stealth and with a lot of money spent on concealment would be negligible compared to the risk of detection by the other side Competent sources indicate that it takes tests of 5 to 10 kilotons to develop most of the thermonuclear warheads, using uranium or plutonium exploders Furthermore, from the military viewpoint, there

must be a series of nuclear tests if any practical results are to be achieved Specialists estimate that it takes from three or four to a hundred and more tests to develop a new type of nuclear warhead (depending on how complicated the device is) In this case the probability of detection grows in geometric progression

A number of additional provisions and agreements could make verification of a nuclear test ban fully reliable Back at the time of the founding of the Pugwash movement* Soviet and American scientists jointly proposed using so called "black boxes" for these purposes (i e , unmanned seismog raphers to register underground tremors). In the opinion of Lynn Sykes and Jack Evernden, two seismologists from Columbia University, fifteen automatic seismic stations de ployed in fixed areas of each of the two great powers and as many stations along the perimeters of their frontiers could virtually render any secret violation of the treaty impossible

In February and April 1986, the leaders of India, Greece, Sweden, Mexico, Argentina and Tanzania offered to assist in verifying a nuclear test ban by siting monitors in areas near the Soviet Union and the United States. The Soviet Union supported the proposal and spoke in favor of far reaching verification means, including on site inspection and the es tablishment of an international supranational network to monitor the ban

The effectiveness of such steps has been demonstrated by an agreement between the USSR Academy of Sciences and the American Natural Resources Defense Council to deploy seismic equipment in the area of the Soviet nuclear testing range at Semipalatinsk in Kazakhstan and the Nevada range in the United States in order to study geological structures It has been confirmed that these structures in the Semipalatinsk area are more rigid than those in Nevada with the result that test blasts at Semipalatinsk produce stronger seismic waves

* A movement of scientists for peace, disarmament and international security founded in 1955 Its founding members included Albert Einstein, Frederic Joliot Curie and Bertrand Russell

than tests of a similar yield in Nevada. This makes it possible to calibrate seismic instruments more accurately and raise their effectiveness still further. The Soviet Union has proposed that this agreement be upgraded to an official intergovernmental one so as to make verification of a potential treaty easier and to compare the effectiveness of the systems proposed for these purposes. In September 1987, within the framework of the above mentioned agreement, two conventional devices with 10 and 70 ton yields were exploded in Kazakhstan in the presence of a large group of scientists from both countries and American Congressmen. The experiment convincingly showed that even such small yield blasts could well be recorded with the help of seismic instruments.

The official American position is that it is necessary to use the hydrodynamic method to monitor compliance with the 1974 and 1976 treaties.

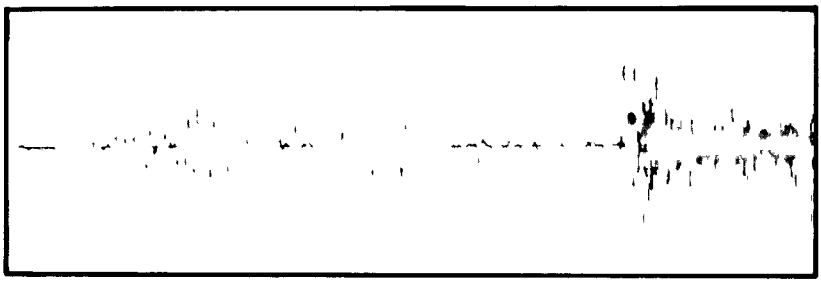
Under this method (the so called CORRTEX system) a satellite hole with an energized cable inside is bored parallel to the emplacement hole in which a nuclear device is to be tested. Electrical pulses of a set frequency are sent through the cable. They are reflected at the end of the cable and recorded by a receiving device. The blast yield is determined by the speed of the blast induced destruction and consequently the shortening of the cable as a result of which it takes the pulses in the cable less time to return. This method, however, requires that personnel from the other side be present at the site for each test in order to record technical data. Soviet experts and many of their American counterparts are of the opinion that the US insistence on using the hydrodynamic method is largely politically motivated, for seismic instruments have proved quite effective for monitoring.

At any rate, there is every reason to assert that technical monitoring means (both seismic ones and others), combined with agreements on confidence building measures and cooperation in this area could resolve the problem of verification and thus remove it as an obstacle to a treaty on a total nuclear test ban.

October 1987. Yevgeni Velikhov (right) and US scientist Thomas Cochran at the site where seismic equipment was installed near the Soviet nuclear testing range

In May 1986 the USSR Academy of Sciences and the American Natural Resources Defense Council signed an agreement to monitor the unilateral Soviet moratorium on nuclear testing. In July that year American instruments were set up near the Soviet testing range at Semipalatinsk in Kazakhstan. The experiment proved a success, and another agreement was signed in June 1987 under which two conventional devices of a 10 ton and a 20 ton yield were exploded (as mentioned earlier). Prior to one of the two blasts, the monitors recorded seismic waves caused, as was later found out, by an earthquake not far from New Zealand.

Participants in the experiment



Then the monitors recorded the blast itself. The difference between the two seismograms is quite obvious (see the picture above).
Commenting on the experiment, Tom Downey, a US Congressman who was present at the test site, said:
"Even the smallest blast can be detected and measured. This makes the verification process clear. Scientists have achieved greater success than the diplomats."
Yevgeni Velikhov, Vice President of the USSR Academy of Sciences, added:
"What was done today is a significant step towards the main goal of stopping all nuclear tests. If we can register a 10 ton blast with such certainty, this proves again that nuclear tests can't be concealed."

Testing and Deterrence

On January 15, 1986, the Soviet Union outlined a program for the complete elimination of the world's nuclear arsenals to be carried out in three stages by the year 2000. But until these lethal weapons have been eliminated, the nuclear powers will be interested in maintaining their arsenals at a high enough level to stave off any potential nuclear attack against themselves or their allies.

The Soviet Union is no less interested in this than the United States, and, in fact, has reason to be much more concerned. It is opposed by U.S. strategic forces having more nuclear warheads than the USSR. There still are American intermediate range and forward based nuclear forces deployed within reach of Soviet territory. Nor can the Soviet Union ignore the opposing nuclear forces of third countries. It has to keep in mind that the military strategy of the United States and NATO as a whole provides for using nuclear arms at an early stage of an armed conflict – this despite the fact that the Soviet Union has pledged not to use nuclear weapons first. The key question, therefore, is not whether nuclear deterrence must remain reliable but rather whether it is necessary to continue testing to ensure reliability.

Out of 1,500 nuclear tests, only a few have been carried out to test armaments actually in service *. Most of them have been aimed at testing new designs that are always being made to reduce the weight and size of warheads, economize on rare materials, improve structural strength, and introduce new manufacturing and assembly technology. Even more often tests have been linked with developing new warheads intended for an uninterrupted succession of delivery vehicles and for new conditions of employment in accordance with changing strategic concepts and doctrines. Finally, some

* At a news conference in April 1986 a group of noted American legislators including among others Edward Kennedy, Charles Mathias and Gary Hart pointed out that out of the more than 800 nuclear tests carried out in the United States only 33 had actually had the aim of checking nuclear armaments in service.

series of tests have been carried out to develop fundamentally new warheads of widely different design and destructive power (atom bombs were followed by hydrogen bombs, then came neutron warheads, and now nuclear pumped X ray lasers). It is this that prompted Mikhail Gorbachev to say that " an end to testing would effectively stop the race in the most dangerous area the development of new kinds of nuclear weapons and their upgrading "

Foremost specialists both in the Soviet Union and other countries believe that armaments currently in service that have once been tested need not be checked by further test explosions Production materials, tools and technologies have been standardized to manufacture perfectly identical products with guaranteed adequate performance without any additional experiments The fissionable materials most often used as exploders in thermonuclear warheads (uranium or plutonium alloys) have very long half lifes and are therefore virtually immune to degradation Plutonium has a half life of 24,000 years, uranium 235 800 million years; and uranium 238 4,500 million years The less stable components like the tritium thermonuclear charge (the half life of tritium is 12 years) or chemical exploders can be detached for periodic checks Such checks do not require test explosions, nor does the checking of replacement components if their introduction is not aimed at re designing the warhead The United States has several types of nuclear warheads with yields of over 150

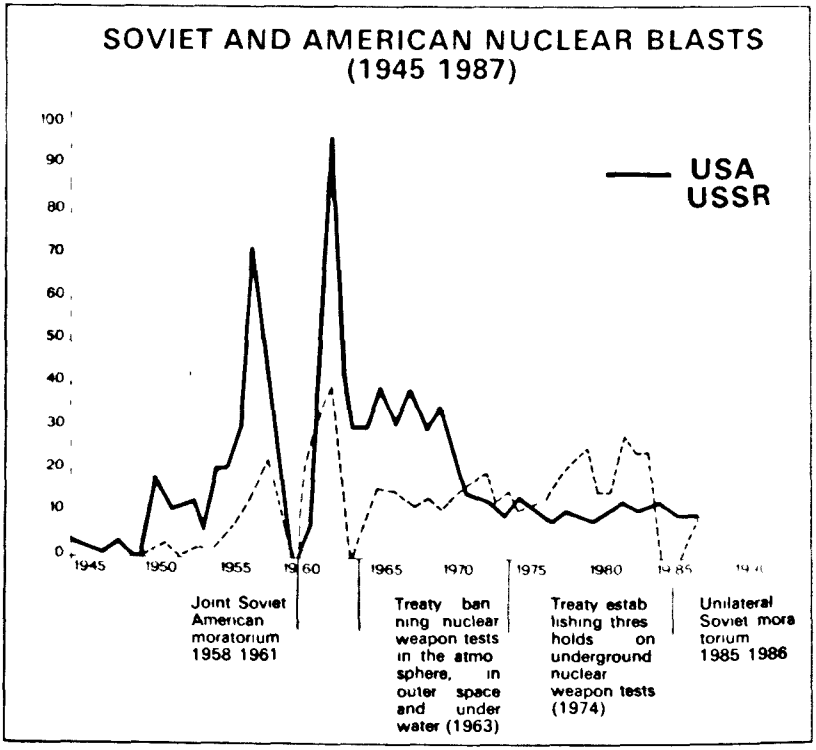
UNDERGROUND NUCLEAR EXPLOSIONS (1985 1987)

	USA	USSR	France	Britain	China
1985	15	7*	8	1	0
1986	15	0	8	1	0
1987	15	16**	6	1	1

* Prior to August 6, 1985 when the Soviet moratorium came into force
** There were also six blasts carried out for economic needs

kt which have not been tested since the signing of the 1974 treaty. However, they have not been phased out, nor is it doubted that they are in good working order.

Nuclear tests are necessary for other purposes. Without them it is impossible to substantially improve or modernize nuclear armaments. Sometimes this involves a long series of tests, especially in developing warheads for new delivery systems when a lot of debugging and checking has to be done. That takes us to the next question: are new weapon systems needed for reliable deterrence or is it enough to have the weapons that already are or are being deployed (that is, weapons that have passed the testing stage, including warhead testing)?



This is not a new question. It was widely debated by politicians and scientists in the context of the freeze campaign which spread on a mass scale in the United States and other Western countries between 1981 and 1983. The Soviet Union also supported the idea of a freeze. Among other things, the freeze campaign called for halting nuclear tests. But the US Administration and all those who opposed a freeze insisted that it was necessary to build up and modernize nuclear weapons in order to strengthen deterrence

Those in favour of a freeze, however, argued that given the existing huge nuclear potentials deterrence did not require any additional military programs. Former US Defense Secretary Robert McNamara put forward a concept back in the mid 1960s which held that the loss of some 70 percent of industry and 30 percent of the population was an unacceptable level of damage even to the world's strongest powers He estimated that this was the damage that would be caused by 400 or so nuclear warheads of the megaton class being exploded over the main administrative and industrial areas in each of the warring countries To inflict that amount of mutual destruction nowadays, the Soviet Union and the United States need to use only 5 to 10 percent of their strategic nuclear forces

The extremely excessive level of the world's nuclear potentials becomes even more obvious if we take into account the fact that, in addition to their strategic forces, the United States and the Soviet Union have medium range and shorter-range systems, not to mention that there are also third countries having nuclear weapons. There are 50,000 nuclear warheads in the world with a total yield of 18,000 Mt. In other words, deterrence is now based on a colossal surplus of destructive power It does not need any more.

New systems of nuclear arms, in fact, undermine strategic stability Practically all the succeeding generations of nuclear armaments and their combat control and communications systems are geared to all kinds of scenarios of "a limited nuclear war" on a global or regional scale In the paradoxical world of nuclear strategy, the limited nuclear-war doctrine is

tied not to a limited quantity of these weapons but to their huge surpluses which defy any rational criteria for sufficiency of destructive power (such as McNamara's "damage levels")

When there are so many nuclear armaments of such devastating power that nuclear attack plans can designate all targets of any practical value to be destroyed many times over (i.e., large and medium sized population centres, industrial facilities and economic infrastructure), any further expansion of nuclear potentials becomes completely senseless. In the late 1950s this situation was called overkill. In an effort to resolve this deadlock, American strategists invented all sorts of scenarios providing for limited nuclear warfare, all of which are based on the academic premise that in conditions when the vital values of opposing countries are being held "hostage" by each other, it would be possible to deal selective strikes at a wide range of military and economic targets. It is claimed that these operations would make it possible to gain substantial strategic advantages or even "win" a war without overstepping the ultimate limit beyond which lies total destruction. This is said to be the watershed between an "imaginable" and "unimaginable" nuclear war. Such is the logic that has formed the basis of all American nuclear warfare concepts from the early 1960s to the present.

However dubious and unrealistic these ideas are, there is one outstanding "advantage" in them from the point of view of the American military industrial complex. They allow for the unending modernization of nuclear armaments and their combat control systems in order to make them more survivable, accurate, powerful, versatile and retargetable. The new concepts and doctrines envisage ever more sophisticated military hardware, producing constant challenges for new weapon systems to meet increasingly ambitious military plans.

Though patently unrealistic, the limited nuclear war doctrine has proved quite dangerous. Once the overkill deadlock became widely comprehended both by experts and the public at large first, in the late 1950s when American territory came within reach of nuclear weapons, and then in the late

1960s when strategic parity began to shape up between the Soviet Union and the United States the limited nuclear war concept seemed to give a second wind to the nuclear arms race and made it much more difficult to curb through agreements The fact that there has been a "psychological adaptation" to nuclear weapons, along with the illusion that their "selective" use would increasingly seem to resemble conventional warfare both in combat tasks and in destructive effects is very dangerous Indeed, the view of nuclear arms as close companions of conventional and chemical weapons both in terms of technical aspects (multipurpose delivery vehicles, basing modes and storage) and in combat uses (targets, battlefield objectives, stage and priority of employment) is becoming more and more common

The various scenarios of a limited nuclear war are not just the pipe dreams of armchair strategists It is a reality manifested in combat hardware and armaments, programed into the onboard computers of missiles and aircraft and into command post computers, and written into the combat plans of staffs and commands

Political logic and the laws of psychology derived from the entire experience of countless wars in the "pre nuclear" age, just like many special studies concerning nuclear weapons, indicate that a nuclear war would not follow any rational rules or limit itself to some area It would very quickly erupt into a total and uncontrolled nuclear war, with human civilization being the ultimate victim It is merely an illusion to hope that a limited nuclear war could be translated from a doctrine into a reality What makes these concepts so dangerous is that they encourage the first use of nuclear weapons and could lead to a crisis situation and the step across the fatal limit, when all control would be lost

Yet another step, perhaps the last one in developing the concept of a limited nuclear war with the aim of subordinating nuclear strategy to conventional warfare principles was made when President Reagan unveiled his Strategic Defense Initiative SDI opens up a truly boundless field of competition between offensive and defensive armaments, including

nuclear tipped systems, both in outer space and on earth Space based anti missile systems threaten to make the strategic situation even less predictable and a global conflict could be unleashed in a much faster, sudden and uncontrollable way than any scenario can envisage

All these problems have a direct bearing on a total nuclear-test ban. Otherwise, it is impossible to explain why the idea of reaching such an agreement became practical policy in the late 1950s when the international community was just beginning to understand that there was a nuclear deadlock. But when, after some preparation, test ban negotiations commenced, more and more obstacles appeared that were linked not with the technical aspect of verification but with the evolution of nuclear strategy. These negative factors made themselves felt particularly in the mid 1980s. The Soviet Union's unswerving commitment to a test ban, demonstrated by its eighteen month-long unilateral moratorium on nuclear explosions and by far reaching proposals regarding verification, exposed the military, political and strategic substance of the matter.

Now it has become perfectly clear that a total nuclear test ban is not a side issue or some partial measure in the list of potential steps towards disarmament. On the contrary, it is a problem that is affecting the core of the present strategic situation and largely determining the further evolution of the global military situation and of strategic concepts and military programs, as well as the prospects for dialogue in the field of arms limitation and disarmament

Military Programs and Nuclear Tests

The Soviet moratorium and the proposal that nuclear tests be completely halted came when the United States was half way through another stage of renewing its nuclear arsenal and developing a fundamentally new generation of nuclear

weapons In the course of the 1980s and 1990s the United States plans to add some 29,000 new nuclear warheads to its arsenal After phasing out the obsolete systems, the total number of strategic, medium range and shorter range weapons is to increase from 26,000 to over 30,000 Therefore, the American nuclear arsenal is to grow by 20 percent and be modernized by about 90 percent *

New nuclear warheads cannot be developed without testing In the mid 1980s, thirteen types of nuclear warheads were being either manufactured and deployed in the US armed forces or were soon to be put into production They included nuclear warheads for MX land based ballistic missiles, Trident 1 submarine launched ballistic missiles; air, ground, and sea launched long range cruise missiles, air, ground, and sea launched medium range ballistic missiles, Pershing 2 medium range ballistic missiles, two types of air bombs and two types of anti submarine missiles, an all purpose sea-launched surface to air and surface to surface missile, and two types of artillery shells of various calibers It was planned to manufacture a total of about 16,000 nuclear warheads with yields from 1 to 500 kilotons for these systems of strategic, medium range and shorter range weapons.

Most of these warheads have already been tested and any further blasts would be aimed at improving the design in some minor way Over the next five to ten years nuclear tests in the United States will mostly be for the development of warheads for systems that are still in the R&D stage and due to be adopted in the late 1980s and the 1990s. These include the Trident 2 sea launched ballistic missile, for which two alternative types of warheads are being developed, the Midgetman light intercontinental mobile missile, new models of long range cruise missiles, and the next generation of shorter range nuclear missiles of the air to ground, ground-to ground and air to air classes. This program provides for testing nine types of nuclear warheads of which about 13,000

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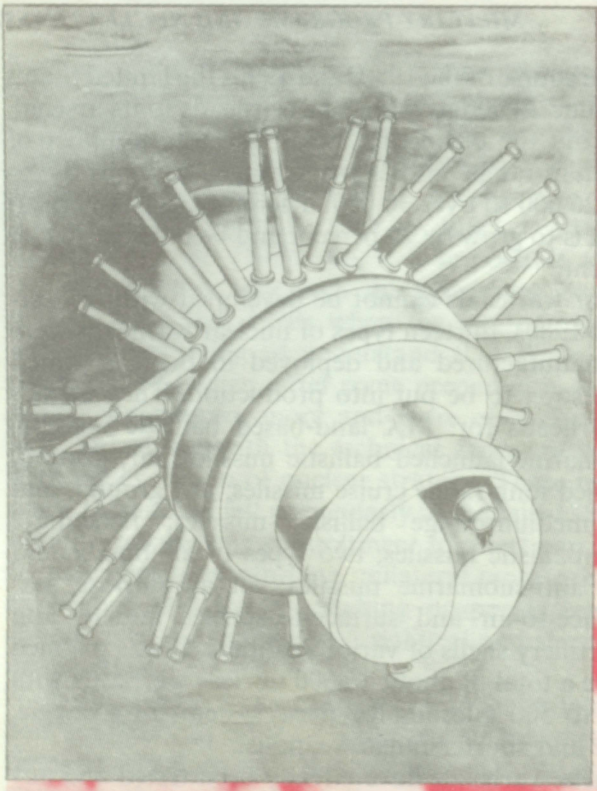
* Calculation based on *Nuclear Weapons Databook* Vol 1 "US Nuclear Forces and Capabilities", Cambridge, Mass , 1984, pp 14-15



The 18-month Soviet moratorium did not halt nuclear testing in Nevada. Experts estimate that 80 percent of the tests are aimed at modernizing existing nuclear warheads and developing new weapons, including third-generation weapons such as a nuclear-pumped laser (above).

are to be produced. Should a total test ban treaty be signed, it would be difficult and in many cases impossible to carry out these plans

In addition to developing more sophisticated nuclear warheads for new delivery vehicles, the American test program assigns an important place to the development of fundamentally new nuclear warheads belonging to the so called third generation (atomic weapons being the first and thermonuclear weapons, the second generation). The third generation warheads will have some of their lethality particularly enhanced (e g , X ray or neutron radiation, or electromagnetic pulse). They are mostly envisaged within the context of the Strategic Defense Initiative.

First of all, SDI calls for developing a nuclear pumped X ray laser which is to be used to intercept ballistic missiles as they leave the atmosphere, destroy satellites and other space objects, and discern live warheads from dummy targets in the middle stage of a missile flight path

In addition, new generation neutron warheads are being developed, specifically for the modernized Sentry anti missiles intended to intercept enemy warheads in the final stage of a missile flight path as part of the last, ground based echelon of a large scale ABM defense system. Finally, nuclear warheads producing a strong electromagnetic pulse in a high atmospheric blast are designed to cut off the power supply in the command and communication systems of the other side.

Given the total impossibility of creating third generation nuclear weapons without continued testing over the next 10 to 15 years, a test ban would therefore prohibit much of the work that Washington hopes to carry out under the SDI project

All told, Washington's refusal to stop nuclear testing is due, first and foremost, to its desire to carry on with its vast military programs Its attitude to this issue, better than any logical or theoretical arguments, gives the lie to the official guidelines of American military policy, especially America's professed wish to "free" humanity of nuclear weapons by moving from deterrence based on the threat of nuclear

retaliation to deterrence based on reliable defense, and also America's intention to build a non nuclear shield with the help of SDI.

Political Struggle Over the Test Issue

In light of America's long term plans and programs and because a test ban would radically curb them and in some cases stop them altogether, it would be natural to ask if there is any sense at all to hope for a change in the American approach to the nuclear test ban problem

On the other hand, opposition to the arms race has recently become increasingly tangible among the public at large and realistic minded representatives of ruling circles in the United States and other Western countries. The SDI program has been facing mounting criticism and resistance, with Congress cutting back appropriations for Star Wars every year. There has been some internal struggle over the offensive nuclear arms programs Meanwhile, support for a total nuclear test ban has grown visibly. The decisive catalyst of this trend was the eighteen month long Soviet moratorium.

Even among those who support field tests to check nu clear warheads in service, there have been increasing calls for serious limitations on such tests. A proposal has been made to fix as low a ceiling on tests as possible (within the limit of several kilotons), to set a minimum annual quota for testing, and to introduce confidence building measures that would make verification easier (notification of planned explosions, information about test yields, etc). It has been pointed out that if the underground yield ceiling is reduced to one kiloton and the annual quota is brought down to one or even two or three nuclear tests, this would differ little from a total ban on nuclear testing

Paul Doty of Harvard University made an interesting proposal when he suggested that there be just a few tests to check the reliability of existing nuclear weapons, they should be carried out, he said, once every three or four years by a series of several explosions but on one and the same day In this case the design of the warhead tested by the first blast could not be improved and tested by the subsequent explo sions done on that day Consequently, each next test of new systems could only be carried out in three or four years' time

The Soviet side initially took a negative view on the idea of "regulating" nuclear tests. It was felt that this was a half solution, whereas the Soviet Union wanted to remove the issue from the agenda altogether and therefore strove for a total test ban as a radical step that would prevent the nuclear arms race from being re-channelled into developing and modernizing low-yield warheads.

However, the Soviet Union did not rule out interim solutions to the nuclear test-ban problem Mikhail Gorbachev said that in proposing various agreements to the other side, the Soviet Union did not at all reject the possibility of a compromise

Soviet readiness for compromise was shown quite clearly in Reykjavik. The Soviet Union demonstrated a constructive and flexible approach to the test ban problem and stated that it was possible to advance to the goal of a ban by stages. As a priority matter, it would be possible to consider an annual quota of nuclear tests and the lowering of yield limits, as well as the future of the 1974 and 1976 treaties, and any measures to ensure reliable verification. To this end, the Soviet Union proposed opening talks immediately this with or without the United States joining in the Soviet moratorium which was then in force.

This proposal was made in a package with other proposals on nuclear and space weapons America's hardline attitude on the SDI issue made it impossible to reach any formal agreement between the two countries in Reykjavik But the issues for negotiations on nuclear tests were identified, which in itself opened a way to resolving the deadlock.

To a certain degree, this happened even contrary to American intentions It appeared that the American side was acting on the assumption that the unilateral Soviet moratorium could not continue indefinitely and that the Soviet Union would eventually have to resume nuclear explosions Things would then go back to the way they were, a situation which would very much suit the interests of those who were opposed to banning tests or even adopting any sort of limitations on them

So why was the Reagan Administration compelled to abandon its rigidly negative attitude after all? First and foremost, because of the political will and profound sense of responsibility for the future of peace shown by the Soviet Union By extending its moratorium several times, the Soviet Union placed the White House in a defensive position. Washington was forced to repeat again and again that the moratorium "was not in the security interests of the United States or its friends and allies", a statement which became less and less convincing

Furthermore, the Administration had to take into account the fact that support for an agreement between the Soviet Union and the United States had made itself felt in Congress, and it grew in step with the expanding political effect of the Soviet moratorium. While only a few members of the House of Representatives urged the United States government to back the Soviet initiative in 1985, a year later there were as many as 150 Even the then Republican-dominated Senate called on the President to resume talks immediately on a complete and universal ban on nuclear weapon tests By a vote of 234 to 155, the House of Representatives called for imposing a year-long moratorium on nuclear tests in excess of 1 kt as of January 1, 1987 (provided the necessary monitoring instruments were deployed on Soviet and US territory, with each of the two countries conducting tests at only one testing range). But the more conservative Senate refused to back up the proposal. A year later, in 1987, the House again approved a similar amendment to the 1988 military-budget bill.

Needless to say, the Administration has been irritated by

such signals from Capitol Hill. But since the funding of military programs depends on Congress, it cannot ignore them. Congress has trimmed some of these programs, sometimes substantially, in order to pressure the Administration into being more constructive in its approach to arms limitation. The White House has had to come up with ways to neutralize opposition from the liberals and moderate conservatives in Congress and define areas in which it can compromise with them. It is in this context that the Administration's revived "interest" in monitoring compliance with the limitations fixed in the 1974 and 1976 treaties must be considered. In short, internal political pressures, which even hardliners in the US leadership cannot ignore, are becoming an ever more serious factor in American politics, including matters related to a nuclear test ban.

In the Interests of Universal Security

The effect of the Soviet moratorium reaches far beyond the problem of underground nuclear tests. This country's patient and steadfast line towards halting the nuclear arms race completely contradicts the speculation that Soviet policy is inconsistent, time serving or motivated by purely propagandistic aims. The unilateral moratorium on nuclear tests proved to be such an impressive action of international significance that it can be called a paragon of policy needing no advertisement or propaganda since it influences world opinion by virtue of its content.

The Soviet move evoked favourable political responses from a wide majority of countries. It fully corresponded to the spirit of numerous UN General Assembly resolutions calling for a ban on nuclear tests and was highly assessed at the 8th Non-Aligned Summit Conference in September 1986.

The moratorium was also consonant with the efforts undertaken in various parts of the world to set up zones free of nuclear weapons

Soviet efforts to bring about a test ban are making a

THE SOVIET MORATORIUM A CHRONICLE

July 30, 1985	Mikhail Gorbachev, General Secretary of the CPSU Central Committee, makes the following statement "The Soviet Union has decided to stop unilaterally all nuclear explosions, starting from August 6 this year We call on the government of the United States to stop its nuclear explosions starting from this date which is marked worldwide as Hiroshima Day "
August 6, 1985	The Soviet moratorium comes into effect with a scheduled expiration date of January 1, 1986
January 15, 1986	The moratorium is extended until March 31, 1986
March 14, 1986	The Soviet Union announces that after March 31 it will not conduct a nuclear test unless and until the United States does so
May 14, 1986	The moratorium is extended until August 6, 1986
August 18, 1986	The moratorium is extended until January 1, 1987
December 18, 1986	The Soviet government issues a statement saying that the USSR is prepared to continue honoring its moratorium but would resume testing if and when the United States were to set off a nuclear explosion in 1987 The Soviet Union the statement further declares, would be ready at any moment to halt its test program if the United States were to do the same

specific contribution to strengthening nuclear non proliferation. It is well known that it took a lot of time and effort to draft the Treaty on the Non-Proliferation of Nuclear Weapons. The attitude of many countries towards it was reserved, a manifestation of their resentment for what they saw as the division of the world into two unequal and inequitable groups of countries those which had "succeeded" in acquiring nuclear weapons and those which had not. That is why the refusal of the latter group to acquire nuclear weapons was balanced, as it were, by the appeal, recorded in Article 4 of the treaty and addressed, naturally, to the nuclear powers, that effective action be taken to bring about nuclear disarmament. At Sweden's proposal, the need to seek the discontinuance of all test explosions of nuclear weapons was stated in the treaty's preamble.

But each of the three conferences that have been held once every five years reviewing the operation of the treaty have pointed out the failure to observe these provisions. Given that, some of the non nuclear parties to the treaty might feel justified in considering themselves free of the limitations it stipulates, especially since the treaty is due to expire in 1995. In other words, to enhance the regime of non proliferation it is absolutely essential to begin abolishing nuclear weapons, however slowly or gradually, and reducing their role in military strategy. In this sense, the stopping of nuclear explo sions would be an important practical step preventing the proliferation of nuclear weapons both vertically (the expansion and modernization of existing nuclear arsenals) and horizontally (i e., among countries that have the technology to build such arms).

All these factors have made it possible to resume the Soviet US dialogue on nuclear tests. There have been six bilateral meetings of experts in Geneva since mid 1986, and at a meeting in Washington on September 17, 1987, Soviet Foreign Minister Eduard Shevardnadze and US Secretary of State George Shultz agreed to open full scale talks on the issue.

These talks began in Geneva on November 9, 1987. As

was officially stated by both sides, their primary goal is to reach agreement on effective verification measures which would make it possible to ratify the 1974 and 1976 treaties and begin elaborating further interim limitations on nuclear tests. The ultimate goal is to discontinue all tests as part of an effective process of disarmament. This formula reflects the views of both countries: it defines a total nuclear test ban as the goal of the negotiations (which the Soviet Union considered necessary), and places this prospect within the context of disarmament, including the elimination of nuclear arms (on which the United States insisted).

It is definitely a hopeful sign that these talks have got under way, though it is disappointing that no specific deadlines have been fixed for reaching agreement Some comments made by American officials in reference to the talks are even more disappointing, if not actually a cause for worry. At a briefing held at the US State Department the day after the talks opened it was declared that in the event of a 50 percent reduction in offensive strategic armaments the need for nu clear tests, rather than decreasing, might even grow (allegedly to ensure a higher degree of reliability of the remaining nuclear arsenals). Skepticism was voiced concerning the possibility of reducing the nuclear-test yield limit below 150 kt. Spurgeon Keeny, President of the Arms Control Association, an influential public organization in the United States, summed up Washington's official views by saying: "The Administration is entering this negotiation clearly opposed to the stated goal "

Nowadays, however, even conservative politicians are having to give up their hardline and totally negative behaviour which until recently was dominating as regards the issues of nuclear tests and arms limitation in general. This behaviour is clearly becoming counter productive from the point of view of both domestic and international policy. This is an exceptionally important result of the unilateral Soviet moratorium and all efforts by peace groups to prohibit nuclear testing

The first round of the Soviet American talks ended on

November 20, 1987. They formulated short term objectives for both sides and defined the pattern of their interaction in this field It was decided that in the first stage (possibly in the first half of 1988) the two sides would agree upon effective verification procedures that would enable the 1974 and 1976 treaties to be ratified Preparations have started for a joint experiment at the test sites at Semipalatinsk and Nevada This was proposed by the Soviet Foreign Minister back in April 1987 with a view to elaborating improved verification tech niques It is expected that following the expriment the Soviet Union and the United States can make the final decision about the most effective and mutually acceptable verification procedures (including CORRTEX) to monitor compliance both with the 1974 and 1976 treaties and with any future agreement further limiting nuclear tests At the negotiations agreement was reached to set up special working groups (to prepare the experiment, consider technical aspects of verifi cation and study political and legal issues). In other words, there are prospects for some practical headway to be made in this important area of arms control and disarmament

As the Soviet Union sees it, what is necessary is a combination of bilateral and multilateral approaches in the handling of the problem of nuclear tests On June 9, 1987, seven socialist countries submitted a joint document to the Geneva Conference on Disarmament entitled The Basic Provisions of a Treaty on Complete and General Prohibition of Nuclear Weapon Tests Proposals concerning verification had been made at this multilateral forum by Canada, Australia, New Zealand and Norway.

The Soviet Union's attitude to nuclear testing bears out its leadership's commitment to the principles of a new political thinking. This thinking is based on profound insights into the realities of the nuclear and space age and the understanding of the fact that security can no longer be viewed primarily as a military or a military technical problem. A fundamentally new approach is needed. There must be a search for political solutions to existing problems, solutions that can guarantee security more firmly and with much less expenditure of

financial, material and intellectual resources. The USSR considers it necessary to adhere to this approach both with regard to arms limitation and military planning in general, and to international affairs in the broadest sense of the term.

Not that the Soviet Union is disregarding its own security interests. Because of them, it was ultimately forced to resume nuclear testing in February 1987. But the Soviet Union does not regard its security along the lines of expanding and modernizing its nuclear arsenals. It is convinced that the nuclear arms race, of which nuclear tests form an integral part, far from improving national and international security, is undermining it. On the other hand, the complete halting of nuclear explosions would help to make peace more secure and the security of all members of the international community much more dependable.

In light of the Soviet-American treaty on eliminating medium-range and shorter-range missiles and the emerging prospects for a sizable cut in strategic offensive arms, a nuclear test ban, in the Soviet Union's opinion, is becoming an even more pressing problem. "Since we have begun to disarm," Mikhail Gorbachev said following the summit meeting in Washington, "all problems should be considered in this context, and we should think and act accordingly." Proceeding from this, the Soviet Union proposed a Soviet-US moratorium on nuclear tests to be adopted by both countries for the duration of their talks on this issue. This proposal was unfortunately not accepted by Washington. It is to be hoped that the talks will bring the Soviet and American partners closer to their ultimate objective: a complete ban on nuclear testing. For its part, the Soviet Union will make every effort to achieve this goal.

Алексей Георгиевич Арбатов,

Владимир Георгиевич Барановский

ПРЕКРАЩЕНИЕ ЯДЕРНЫХ ИСПЫТАНИЙ:
простой, эффективный, но еще
не сделанный шаг

на английском языке

Цена 20 к.

Alexei ARBATOV
Vladimir BARANOVSKY

Stopping Nuclear Tests: a simple and effective step as yet untaken

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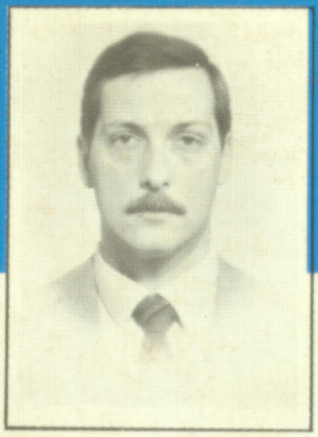

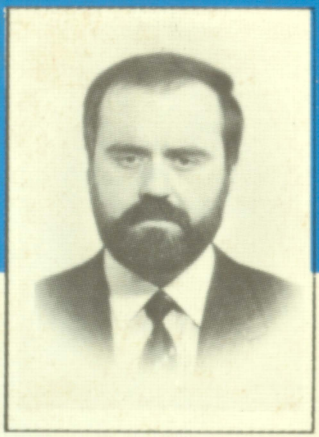

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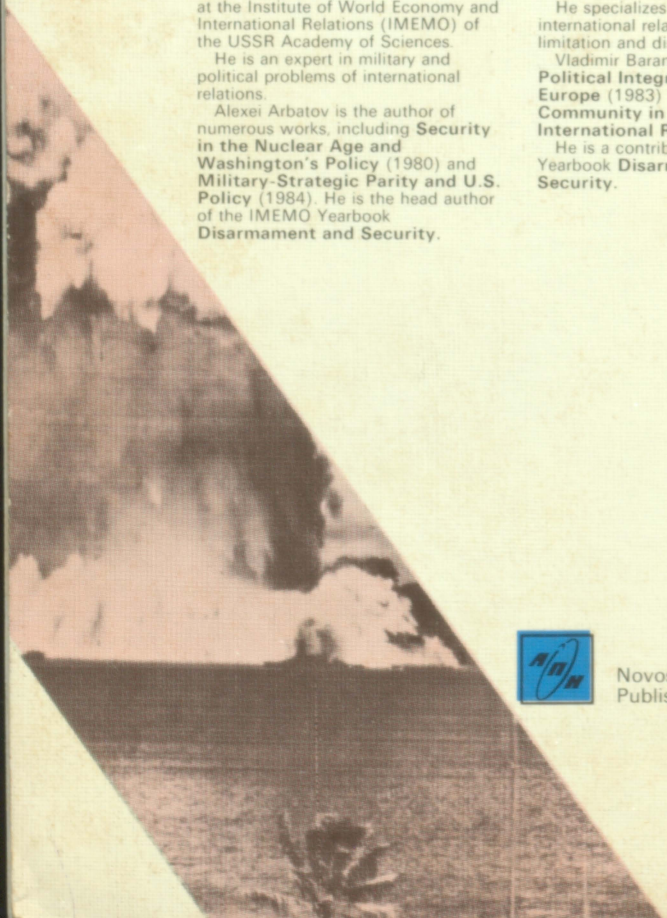

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